

REMARKS/ARGUMENTS

Claims 1-12 and new Claims 13-15 are active in the case. Reconsideration is respectfully requested.

The present invention relates to a solid catalyst component and to a catalyst for the polymerization of olefins.

Specification Amendment

The text has been amended at page 10, line 6 to delete a repetition of the name of a phthalate ester. Entry of the amendment is respectfully requested.

Claim Amendments

Claims 1, 2 and 10 have been amended by limiting the magnesium compound component of the solid catalyst component to a dialkoxy magnesium compound, as, for instance, set forth in Claim 11. Other minor amendments of an editorial nature have also been made to a number of the claims. None of the amendments introduce new matter into the case. New Claims 13 -15 are supported by page 8, lines 9-10 and the paragraph bridging pages 9 and 10. Entry of the amendments and new claims into the record is respectfully requested.

Invention

The present invention is directed to a solid catalyst component for the polymerization of olefins. In an embodiment the solid catalyst component comprises (a) a dialkoxy magnesium compound, (b) titanium tetrachloride, (c) a phthalic acid diester or a derivative thereof, and (d¹) a hydroxyl group-containing hydrocarbon compound having the following formula (1) $(R^1)_mX^1(OH)_n$, wherein R¹ is an alkyl group having 1 to 10 carbon atoms, a

cycloalkyl group having 3 to 10 carbon atoms or a halogen atom, m, which represents the number of groups R^1 , is 0, 1, or 2, wherein when m is 2, the two R^1 groups may be either identical or different, n, which indicates the number of hydroxyl groups, is 2 or 3, and X^1 represents a group obtainable by removing (m+n) hydrogen atoms from benzene, cyclopentane, cyclohexane or naphthalene.

In another embodiment of the catalyst component, component (d) is (d^2) which is a mercapto group-containing hydrocarbon compound having the following formula (2) $(R^2)_sX^2(SH)_t$, wherein X^2 is a benzene nucleus.

Other embodiments of the invention include catalysts prepared from the solid catalyst components.

Prior Art Rejection

An important feature of the solid catalyst component of the catalyst system of the invention is that a compound (d^1) or (d^2) is employed. Compound (d^1) is a diol or triol compound of the formula $(R^1)_mX^1(OH)_n$, wherein R^1 is an alkyl group having 1 to 10 carbon atoms, a cycloalkyl group having 3 to 10 carbon atoms or a halogen atom and m is 0, 1, or 2. The nuclear moiety X^1 of the compound is derived from benzene, cyclopentane, cyclohexane or naphthalene. Compound (d^2) has the formula $(R^2)_sX^2(SH)_t$ and is a monothiol or dithiol compound wherein R^2 is an alkyl group having 1 to 10 carbon atoms, a cycloalkyl group having 3 to 10 carbon atoms or a halogen atom and s is 2. The nuclear moiety X^2 of the compound is derived from benzene.

The significance of the alcohol or thiol compound on the properties of the catalyst of the invention for olefin polymerization is shown in the attached Declaration (37 CFR 1.132) where a number of experiments are presented which show superior results for catalysts

prepared from solid components as defined in the present claims. The results of the experiments conducted are shown in the following table.

TABLE

	Polymerization activity (g-PP/g-cat.)	HI (wt%)	MI (g/100min)
Example 2	51,100	98.5	7.9
Example 3	45,700	98.1	8.9
Example 4	52,100	98.7	6.5
Example 5	51,900	98.1	8.2
Example 6	50,600	98.2	9.5
Example 7	47,500	98.4	7.9
Example 8	52,100	98.1	7.3
Example 9	52,800	98.6	6.3
Experiment 1	51,500	98.5	6.8
Experiment 2	50,700	98.6	6.5
Experiment 3	55,600	98.4	8.1
Experiment 4	57,900	98.1	7.8
Experiment 5	52,100	98.5	6.9
Experiment 6	48,900	98.9	9.1
Experiment 7	50,200	98.4	8.5
Experiment 8	49,600	98.6	7.9
Experiment 9	49,800	98.7	8.6
Experiment 10	53,400	98.3	9.5
Experiment 11	52,100	98.2	11
Experiment 12	55,100	98.1	11
Experiment 12	56,800	98.0	10
Example 1	46,200	98.9	3.2
Comparative experiment 1	45,100	98.7	3.0
Comparative experiment 2	41,200	98.0	7.5
Comparative experiment 3	25,700	98.1	8.0
Comparative experiment 4	28,200	98.5	7.5

Examples 2 and 4 to 9 of the specification and Experiments 1-5 of the declaration, which describes solid catalyst components prepared from various hydroxyl group-containing hydrocarbon compounds that contain either two or three hydroxyl groups and from a dialkoxy magnesium compound, result in polypropylene products that exhibit remarkably

higher melt indexes than that of polypropylene obtained from a catalyst whose solid component is prepared using a hydroxyl group-containing hydrocarbon compound which has one hydroxyl group and a dialkoxy magnesium compound as described in Example 1 of the present application.

The discussion above is pertinent to the application of the Job, Wagner, Zum Mallen and Hosaka references cited and applied against the present claims, because these patents fail to teach a solid catalyst component prepared from a diol or triol or thiol compound and from a dialkoxy magnesium compound as defined in the present claims and thereby fail as disclosures upon which to base a rejection of the claims in view of 35 USC 102. Moreover, because the polypropylene polymer products produced using the catalyst embodiments of the invention have significantly higher melt indexes than polymer products prepared from catalyst embodiments prepared from solid catalyst components prepared in turn from phenol as an active ingredient as disclosed in each of the Job, Wagner, Zum Mallen and Hosaka references, the invention as claimed is believed to be patentably distinguished over these references.

As to Murata et al, the carrier that is disclosed therein is prepared from magnesium metal. There is no teaching or suggestion of employing a dialkoxy magnesium compound for the preparation of a solid catalyst component. Comparative Experiment 3 of the enclosed declaration is significant at this point, because it describes a experiment which is the same as Example 1 of Murata et al except that 3-chlorocatechol (an alcohol of the present invention) was employed as the alcohol reactant instead of the 2,2,2-trichloroethanol. The results obtained show that the polymerization activity of the catalyst within the scope of the patent of Comp Exp. 3 is substantially inferior to the activity of catalysts within the scope of the invention as claimed, particularly the catalyst embodiments of Examples 2 and 4-9 and Experiments 1 to 5.

Comp. Exp 4 of the declaration is also pertinent to the disclosure of Murata et al, because it is a repetition of the procedure of Example 1 of the patent except that thiophenol was employed in the preparation of the solid catalyst component instead of 2,2,2-trichloroethanol. The resulting catalyst material exhibited substantially inferior polymerization activity in comparison to the catalyst embodiments within the scope of the present invention. Accordingly, in view of the discussion above, it is believed clear that the invention as claimed is neither anticipated by the cited prior art, nor obviated by these references. Withdrawal of the rejections that have been made based on 35 USC 102 is respectfully requested.

It is believed that the application is in condition for allowance. Early notice to this effect is earnestly solicited.


Respectfully submitted,

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Appln. No. 10/030,120
Declaration, 37 CFR 1.132



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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
Kunihiko TASHINO, et al : EXAMINER: BROWN, J.
SERIAL NO: 10/030,120 :
FILED: JANUARY 24, 2002 : GROUP ART UNIT: 1755
FOR: SOLID CATALYST COMPONENT :
AND CATALYST FOR
POLYMERIZATION OF OLEFINS

DECLARATION 37 CFR 1.132

COMMISSIONER FOR PATENTS
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SIR:

Now comes Runihiko Tashino who deposes and says that:

- 1) I am one of the inventors of the above-identified application.
- 2) I have been employed by Toho Titanium Ltd. where I have been engaged in the development of magnesium-titanium Ziegler-Natta catalysts.
- 3) Presently, I am employed by the Toho Catalyst Co., Ltd., which is a subsidiary of Toho Titanium co., Ltd.
- 4) I have read the outstanding Office Action from the U.S. Patent Office and each of the references cited therein against the present claims.

5) That in order to demonstrate the superior property aspects of olefin polymerization catalysts prepared from the solid catalyst material of the present invention over catalysts prepared as described in the cited and applied references, the following comparative evidence has been obtained.

Experiment 1

The same experiment as described in Example 4 of the present specification was conducted, except that 0.13 g of 3-ethylcatechol was used as the alcohol component instead of 0.11 g of catechol. The content of titanium in the resulting solid catalyst component was 2.8 wt %. The results of polymerization are shown in the following Table.

Experiment 2

The same experiment as described in Example 4 of the present specification was conducted, except that 0.16 g of 3,5-diethylcatechol was used as the alcohol component instead of 0.11 g of catechol. The content of titanium in the resulting solid catalyst component was 3.0 wt %. The results of polymerization are shown in the following Table.

Experiment 3

The same experiment as described in Example 4 of the present specification was conducted, except that 0.15 g of 3-chlorocatechol was used as the alcohol component instead of 0.11 g of catechol. The content of titanium in the resulting solid catalyst component was 3.1 wt %. The results of polymerization are shown in the following Table.

Experiment 4

The same experiment as described in Example 4 of the present specification was conducted, except that 0.17 g of 3-bromocatechol was used as the alcohol component instead of 0.11 g of catechol. The content of titanium in the resulting solid catalyst component was 3.3 wt %. The results of polymerization are shown in the following Table.

Experiment 5

The same experiment as described in Example 9 of this present specification was conducted, except that 0.18 g of 1,2,3-naphthalenetriol was used as the alcohol component instead of 0.16 g of 2,3-naphthalenediol. The content of titanium in the resulting solid catalyst component was 3.0 wt %. The results of polymerization are shown in the following Table.

Experiment 6

The same experiment as described in Example 3 of the present application was conducted, except that 0.11 g of thiophenol was used as the alcohol component instead of 0.1 g of 1,2-benzene dithiol. The content of titanium in the resulting solid catalyst component was 3.5 wt %. The results of polymerization are shown in the following Table.

Experiment 7

The same experiment as described in Example 3 of the present specification was conducted, except that 0.14 g of 3-methyl thiophenol was used as the alcohol component instead of 0.14 g of 1,2-benzene dithiol. The content of titanium in the resulting solid catalyst component was 3.7 wt %. The results of polymerization are shown in the following Table.

Experiment 8

The same experiment as described in Example 3 of the present specification was conducted, except that 0.15 g of 3-ethyl thiophenol was used as the alcohol component instead of 0.14 g of 1,2-benzene dithiol. The content of titanium in the resulting solid catalyst component was 3.7 wt %. The results of polymerization are shown in the following Table.

Experiment 9

The same experiment as described in Example 3 of the present specification was conducted, except that 0.16 g of 3-methyl benzene-1,2-dithiol was used as the alcohol component instead of 0.14 g of 1,2-benzene dithiol. The content of titanium in the resulting solid catalyst component was 3.8 wt %. The results of polymerization are shown in the following Table.

Experiment 10

The same experiment as described in Example 3 of the present specification was conducted, except that 0.17 g of 3-ethyl benzene-1,2-dithiol was used as the alcohol component instead of 0.14 g of 1,2-benzene dithiol. The content of titanium in the resulting solid catalyst component was 3.8 wt%. The results of polymerization are shown in the following Table.

Experiment 11

The same experiment as described in Example 3 of the present specification was conducted, except that 0.16 g of 3-chlorothiophenol was used as the alcohol component

instead of 0.14 g of 1,2-benzene dithiol. The content of titanium in the resulting solid catalyst component was 3.8 wt %. The results of polymerization are shown in the following Table.

Experiment 12

The same experiment as described in Example 3 of the present specification was conducted, except that 0.17 g of 3-chlorobenzene-1,2-dithiol was used as the alcohol component instead of 0.14 g of 1,2-benzene dithiol. The content of titanium in the resulting solid catalyst component was 3.5 wt %. The results of polymerization are shown in the following Table.

Experiment 13

The same experiment as described in Example 3 of the present specification was conducted, except that 0.18 g of 3-bromobenzene-1,2-dithiol was used as the alcohol component instead of 0.14 g of 1,2-benzene dithiol. The content of titanium in the resulting solid catalyst component was 3.4 wt %. The results of polymerization are shown in the following Table.

Comparative Experiment 1

The same experiment as described in Example 1 of the present specification was conducted, except that 0.11 g of o-cresol was used as the alcohol component instead of 0.094 g of phenol. The content of titanium in the resulting solid catalyst component was 3.0 wt %. The results of polymerization are shown in the following Table.

Comparative experiment 2

The same experiment as described in Example 3 of the present specification was conducted, except that 0.05 g of methyl mercaptan was used as the alcohol component instead of 0.14 g of 1,2-benzene dithiol. The content of titanium in the resulting solid catalyst component was 3.4 wt %. The results of polymerization are shown in the following Table.

Comparative experiment 3

A catalyst component was prepared by the same method as described in Example 1 of Murata (US Patent 4, 950, 630), except that 0.15 g of 3-chlorocatechol was used as the alcohol component instead of 2.0 ml of 2,2,2-trichloroethanol was conducted. The preparation of a polymerization catalyst and polymerization were conducted by the same procedures described in Example 4 of the present specification. The content of titanium in the resulting solid catalyst component was 3.4 wt %. The results of polymerization are shown in the following Table.

Comparative experiment 4

A catalyst component was prepared by the same method as described in Example 1 of Murata (US Patent 4,950,630), except that 0.11 g of thiophenol was used as the alcohol component instead of 2.0 ml of 2,2,2-trichloroethanol. The preparation of polymerization catalyst and polymerization were conducted by the same method as described in Example 3 of the present application. The content of titanium in the resulting solid catalyst component was 3.4 wt %. The results of polymerization are shown in the following Table.

The results of Examples 1 to 9 are also shown in Table.

	Polymerization activity (g-PP/g-cat.)	HI (wt%)	MI (g/100min)
Example 1	46,200	98.9	3.2
Example 2	51,100	98.5	7.9
Example 3	45,700	98.1	8.9
Example 4	52,100	98.7	6.5
Example 5	51,900	98.1	8.2
Example 6	50,600	98.2	9.5
Example 7	47,500	98.4	7.9
Example 8	52,100	98.1	7.3
Example 9	52,800	98.6	6.3
Experiment 1	51,500	98.5	6.8
Experiment 2	50,700	98.6	6.5
Experiment 3	55,600	98.4	8.1
Experiment 4	57,900	98.1	7.8
Experiment 5	52,100	98.5	6.9
Experiment 6	48,900	98.9	9.1
Experiment 7	50,200	98.4	8.5
Experiment 8	49,600	98.6	7.9
Experiment 9	49,800	98.7	8.6
Experiment 10	53,400	98.3	9.5
Experiment 11	52,100	98.2	11
Experiment 12	55,100	98.1	11
Experiment 12	56,800	98.0	10
Example 1	46,200	98.9	3.2
Comparative experiment 1	45,100	98.7	3.0
Comparative experiment 2	41,200	98.0	7.5
Comparative experiment 3	25,700	98.1	8.0
Comparative experiment 4	28,200	98.5	7.5

6) The data presented above with respect to Examples 2 and 4 to 9 of the specification and Experiments 1 to 5 of the declaration show that the polypropylene polymer products obtained as a result of using catalysts prepared from solid catalyst components prepared in turn from hydroxyl group-containing hydrocarbon compounds which have two or three hydroxyl groups and from a dialkoxy magnesium compound have remarkably higher

melt indexes than the melt index of a polymer obtained from a catalyst prepared from a solid catalyst component prepared in turn from a hydroxyl group-containing hydrocarbon compound which has one hydroxyl group and from a dialkoxy magnesium compound as described in Example 1 of the present specification.

The catalysts prepared from a solid catalyst component prepared in turn from a hydroxyl group-containing hydrocarbon compound and from a dialkoxy magnesium compound as described in Examples 2 and 4 to 9 of the specification and Experiments 1 to 5 of the declaration show remarkably higher activities than the catalyst prepared from a solid catalyst component prepared in turn from a hydroxyl group-containing hydrocarbon compound and magnesium metal as described in Comparative Experiment 3.

The catalysts prepared from a solid catalyst component prepared in turn from a mercapto group-containing hydrocarbon compound and a dialkoxymagnesium (present claim 2) described in Example 3 of the specification and Experiments 6 to 13 of the declaration show remarkably higher activities than the catalyst prepared from a solid catalyst component prepared in turn from a mercapto group-containing hydrocarbon compound and magnesium metal as described in Comparative Experiment 4.

7) The undersigned petitioner declare further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Appln. No. 10/030,120
Declaration, 37 CFR 1.132

8) Further, deponent saith not.

Date

Signature